

Mars Science Laboratory

Data Requirements Documents

EXHIBIT II

April 2, 2004



Jet Propulsion Laboratory
California Institute of Technology

*The data/information contained herein has been reviewed and approved for release by JPL Export Administration
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DATA REQUIREMENT DESCRIPTION	
TITLE: Configuration Management Plan	NUMBER: CM-001
USE: The Plan describes the methods and procedures used to manage the functional and physical characteristics of configuration items, and their interfaces and identification documents, during design, fabrication, assembly, and testing.	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: JPL D-**** MSL <i>Configuration Management Plan</i>
<p>PREPARATION INFORMATION:</p> <p>(1) The Contractor shall establish, within his organization, responsibility for implementing configuration management requirements as specified in this Contract. The responsibilities and methods needed to meet JPL requirements, plus any additional procedures the Contractor deems necessary to adequately manage the configuration, shall be documented in a Configuration Management (CM) Plan.</p> <p>(2) The Contractor CM Plan shall meet the following specific requirements:</p> <ol style="list-style-type: none"> The plan shall describe the Contractor's configuration management organization and assign personnel responsibilities for meeting JPL's CM requirements. The plan shall describe the Contractor's configuration identification system, including drawing and specification standards. The plan shall accommodate the requirements of the Contract relative to JPL technical direction and approvals. The plan shall describe the Contractor's change control system and shall include sample change documents. As a minimum, the plan shall require a change description for each revision letter of every document changed. The plan shall define the interfaces between the Contractor's change control system and JPL The plan shall describe which types of changes will be submitted to JPL for approval. The plan shall define the Contractor's expected time required for processing changes (assume 20 working days for JPL approval). The plan shall define the Contractor's engineering data management activities (including archiving process), documentation approvals, release procedures, and categories of release. The plan shall describe the Contractor's configuration status accounting system including samples of lists and reports used. The plan shall describe the Contractor's approach to verification and configuration audit to ensure that performance and functional requirements have been achieved by the design. The plan shall describe Contractor's approach for using photographs as part of the Configuration Management/documentation process 	

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DATA REQUIREMENT DESCRIPTION	
TITLE: Hardware End Item Data Package	NUMBER: CM-002
USE: Hardware Review / Certification Requirement (HRCR)	PROJECT: MSL
INTERRELATIONSHIP: MA-004, MA-009 — MA-014	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION INFORMATION:</p> <p>An end item data package shall be prepared for each deliverable assembly. The Contractor shall determine the form of the package. The contents of the package shall include, but not be limited to, the following information:</p> <ol style="list-style-type: none"> (1) As-Built data: "As-Built" hardware documentation is a compilation of items describing exactly the configuration of a fabricated serialized assembly including: <ol style="list-style-type: none"> a. Part number and revision letter of each item b. Part description (title) of each item c. Electronic part reference designation d. Manufacturer e. Procurement specification or Source Control Drawing (SCD) number and SCD revision letter. f. Actual part marking g. Traceability number (as assigned) h. Lot date code (when applicable) i. Test/screening lot numbers (when applicable) j. Wafer and wafer lot number (when applicable) k. Serial number (for serialized parts) (2) A complete manufacturing and quality history of the deliverables, including all manufacturing travelers, descriptions of manufacturing environments, and documentation of any dry heat microbial reduction processes performed (when applicable) shall be archived at the Contractor's facility for 3 years after launch. (3) A complete shortage list that itemizes discrepancies between the subject hardware and the requirements of the detail specification. The list shall also itemize the documentation shortages. (4) Operating time data on all major electronic assemblies and time sensitive items. (5) A complete list of the tests performed including a compilation of test data and test results for each test. (6) A copy of all action items generated against the equipment, including open or closed status. (7) A copy of all problem/failure reports generated against the equipment, including open or closed status. (8) A copy of all QA discrepancy reports generated against the equipment, including open or closed status. (9) A summary of all deviations and waivers applicable to the deliverable items. (10) A copy of all MRBs including open or closed status. (11) Evidence of acceptance by Contractor QA. (12) Environmental test report(s) applicable to the deliverable item. (13) Vendor parts and material certification forms (as applicable) shall be archived at the Contractor's facility for 3 years after launch. (14) Precap photographs for each assembly. (15) A summary list of all ECRs generated against the equipment, including open and closed status. (16) Handling and operating constraints, including unique, specific instructions for safety, handling, packaging, storage and shipping, as applicable. (17) Completed Hardware Review and Certification Record (HRCR) form, or JPL approved equivalent. (18) A one time delivery, with updates as required: <ol style="list-style-type: none"> a. A copy of all Environmental Analysis. b. A copy of the Packaging Qualification Verification Report. c. A complete and up-to-date top assembly drawing of each type of delivery. d. A complete and up-to-date mechanical and electrical ICDs for each delivery. e. For electronic assemblies, a complete set of circuit schematics and circuit data sheets. 	

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DATA REQUIREMENT DESCRIPTION	
TITLE: Software End Item Data Package	NUMBER: CM-003
USE: Software Review / Certification Requirement (SRCR)	PROJECT: MSL
INTERRELATIONSHIP: MA-001, MA-005	REFERENCES: MSL P-MAP, JPL D-27175
PREPARATION INFORMATION: A software end item data package or software release/delivery package shall be prepared for each software delivery. The Contractor shall determine the form of the package. The contents of the package shall include, but not be limited to, the following information: <ol style="list-style-type: none"> (1) As-built product identification, including: <ol style="list-style-type: none"> a. Identification of software release by program id, phase, version, date, and build. b. Operating system name and version c. Programming language name, compiler name, and version. d. Supporting development environment name and version (if any) (2) A Release Description Document (RDD) or equivalent which contains: <ol style="list-style-type: none"> a. Functional Requirements/Capabilities of this build b. Instructions or user manual to install and configure the software application, including special test equipment software which are required to support the primary software application (if any) c. Lists of all software deliverables in this build, including special test equipment software (if any) (3) List of dates and versions of all required documents (under CM control). (4) A list of all open/closed anomalies or liens against this delivery. All red-flag anomalies should be closed prior to this delivery review. (5) Verification test procedures/results. (6) Test Verification Traceability Matrix for critical interface requirements. (7) Executable code and source code 	

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DATA REQUIREMENT DESCRIPTION	
TITLE: Support Equipment End Item Data Package	NUMBER: CM-004
USE: Support Equipment Certification Requirement (SECR)	PROJECT: MSL
INTERRELATIONSHIP: MA-004, MA-009, MA-010	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION INFORMATION:</p> <p>An end item data package shall be prepared for each Support Equipment deliverable assembly. The contractor shall determine the form of the package. The contents of the package shall include, but not be limited to, the following information:</p> <ol style="list-style-type: none"> (1) Part number and revision letter of each item (top assembly) (2) Part description (title) of each item (3) A complete list of the tests performed including a compilation of test data and test results for each test. (4) A copy of all action items generated against the equipment, including open or closed status. (5) A copy of all problem/failure reports generated against the equipment, including open or closed status. (6) A copy of all QA discrepancy reports generated against the equipment, including open or closed status. (7) A summary of all deviations and waivers applicable to the deliverable items. (8) A copy of all MRBs including open or closed status. (9) Evidence of acceptance by Contractor QA. (10) If Electronic Ground Support Equipment, an Interface FMECA (11) If Mechanical Ground Support Equipment, Proof-Test records and certification (12) If equipment will be used in ATLO during System-Level Testing, a completed JPL Support Equipment Certification Requirement (SECR) Form 	

Contract No. ***	
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DATA REQUIREMENT DESCRIPTION	
TITLE: Mission Assurance Plan	NUMBER: MA-001
USE: To define the requirements of a Mission Assurance Plan.	PROJECT: MSL
INTERRELATIONSHIP: CM-001, CM-002, CM-003, CM-004, MA-002, MA-003, MA-004, MA-005, MA-006, MA-007, MA-008, MA-009, MA-010, MA-011, MA-012, MA-013, MA-014, MA-015, MA-016	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION INFORMATION</p> <p>The JPL Mission Assurance Plan (JPL D-27175) serves as the master Mission Assurance planning and control document.</p> <p>The plan shall address the following topics:</p> <ul style="list-style-type: none"> (1) Configuration Management (per CM-001) (2) Reliability Assurance (per MA-002) (3) Problem/Failure Tracking and Reporting (per MA-003) (4) Hardware Quality Assurance (per MA-004) (5) Contamination Control (per MA-007) (6) Materials and Processes Control Plan (per MA-008) (7) Electronic Parts Control Plan (per MA-006) (8) Software Quality Assurance (per MA-005) <p>At the Contractor's discretion they may generate either a single Mission Assurance Plan that addresses all of the DRD requirements or individual plans that address the DRDs separately.</p>	

Contract No. ****	
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DATA REQUIREMENT DESCRIPTION	
TITLE Reliability Assurance Plan	NUMBER: MA-002
USE To define in detail the Contractor's reliability assurance program in compliance with the MSL Mission Assurance Plan. The plan shall be imposed on all activities associated with the Contractor, subcontractors, and suppliers' reliability assurance.	PROJECT: MSL
INTERRELATIONSHIP MA-001	REFERENCES MSL P-MAP, JPL D-27175
PREPARATION INFORMATION <p>The Contractor shall prepare a Reliability Assurance Plan in accordance with the Reliability Assurance conditions and requirements contained in the MSL Mission Assurance Plan. The plan shall describe the Contractor's reliability assurance activities, including references to applicable Contractor institutional policies, procedures, specifications, and instructions. It shall also include the following:</p> <ol style="list-style-type: none"> (1) Document Change Log (2) Table of Contents (3) List of applicable documents (4) A description, including appropriate charts, of the reliability assurance organization, management, and responsibilities for accomplishing the various activities, and relationships to the elements of the Contractor's organization and its institutional organizations. (5) A schedule of reliability assurance activities indicating their phase relationships with design, development, procurements, design reviews, hardware reviews, fabrication, system testing, and shipment. (6) A description of responsibilities and techniques for accomplishing reliability assurance activities by or with subcontractors and suppliers. (7) A description of how the Contractor will impose all requirements by appropriate documents on all subcontractors and suppliers. (8) A matrix or table showing all design/reliability analyses to be performed to the assembly level or all assemblies. The responsible authority/engineer shall be noted for each analysis, along with scheduled completion date. Those analyses considered heritage from an existing design should be called out. 	

Contract No. ****	
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DATA REQUIREMENT DESCRIPTION	
TITLE Problem/Failure Reporting Plan	NUMBER: MA-003
USE To document the Contractor's anomaly/problem/failure reporting and processing system for MSL review and concurrence	PROJECT: MSL
INTERRELATIONSHIP MA-001	REFERENCES MSL P-MAP, JPL D-27175
PREPARATION INFORMATION <p>The Contractor's anomaly/problem/failure reporting system shall be described and include, as a minimum, the following:</p> <ol style="list-style-type: none"> (1) Hardware and software to which this reporting system applies and when the reports are to be initiated (i.e., EM, qualification unit, FM, EGSE, MGSE) (2) Describe the initiation and closure process, including who reviews and authorizes closure (3) Risk rating process (4) Subcontractor/supplier anomaly/problem/failure reporting system(s) (5) Transmittal of reports to JPL (when, how, timeliness of) (6) Availability of reports to Contractor management and to JPL (7) Description of automated reporting system, if applicable (8) Possible use of JPL on-line reporting system (9) Availability of summary status reports of existing anomaly/problem/failure reports: open, closed, by subsystem, etc. 	

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DATA REQUIREMENT DESCRIPTION	
TITLE: Hardware Quality Assurance Plan	NUMBER: MA-004 Page 1 of 1
USE: To define and describe the Quality Assurance (QA) Program	PROJECT MSL
INTERRELATIONSHIP: MA-001	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION INFORMATION:</p> <p>The Plan shall include the following:</p> <ol style="list-style-type: none"> (1) Narrative explanations of the QA systems, including methods used, when they are applied, and who performs them. (2) Indications in the plan of proper flow down of all customer requirements to sub-tier vendors to ensure they comply with the intent of customer requirements. (3) A description of existing applicable QA policies and instructions. (4) Organization charts and narrative statements describing the functions, responsibilities, and relationships of each element in the Contractor's organization that implements the quality program, including procurement, engineering, fabrication, test, and quality control. (5) A description of the QA interfaces between JPL and the Contractor, between the Contractor and its suppliers, and between Contractor interdivisional quality organizations. (6) A description of the Electro Static Discharge Damage Prevention techniques utilized by the Contractor and the training processes associated with the prevention techniques. (7) A description of Contamination Control Procedures utilized by the contractor that address materials selection, corrosion prevention, cleaning, cleanliness maintenance, handling, packaging and storage of deliverable hardware and equipment. (8) A description of QA support of Manufacturing Planning and Drawing Reviews, parts and materials screening. (9) A listing and description of all workmanship standards used in support of all deliverable hardware and equipment. (10) A description of QA support of support and test equipment. (11) A description of QA support of functional and environmental testing. (12) A description of QA activities in support of procured hardware. (13) A description of QA documentation and data. (14) A description of Inspection and test flow chart indicating potential inspection hold points for customer QA approval. (15) A description of the non-conforming reporting process. Indications in the plan for proper segregation of non-conforming material that prevents co-mingling of non-conforming hardware with acceptable hardware. (16) A description of the Contractor's Material Review Board (MRB) process. (17) Indications in the plan for training and certification of personnel in critical processes. These include, but are not limited to: plating, anodizing, heat treating, welding, soldering, polymeric applications, cleaning, die attachment, wire bonding, magnetic particle inspection, ultrasonic inspection and liquid penetrant inspection. (18) Indications in the plan that sub-tier vendors are qualified in the above critical processes. (19) Indications that all processes used such as ESD-control, workmanship standards and contamination control are qualified in accordance with NASA, JPL or Contractors equivalent requirements. (20) Indications in the plan for retaining of quality controlled records. These are records that furnish objective evidence of activities performed or results achieved related to fabrication, assembly, integration and test of hardware. These include drawings, manuals, specifications, and other written documentation related to the design, development, manufacture and test of hardware. (21) Indications in the plan to provide for proper handling, packaging, shipping and storage of critical hardware. 	

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DATA REQUIREMENT DESCRIPTION	
TITLE: Software Quality Assurance (SQA) Plan	NUMBER: MA-005
USE: To define and describe the Contractor's SQA Program	PROJECT: MSL
INTERRELATIONSHIP: MA-001, SA-001	REFERENCES: MSL P-MAP, JPL D-27175
PREPARATION OF INFORMATION: The Contractor shall prepare a SQA Plan in accordance with the SQA requirements in MSL Mission Assurance Plan. The plan shall include the following: <ol style="list-style-type: none"> (1) A description of existing applicable Contractor SQA policies, procedures, specifications, and instructions. (2) Charts and narrative statements describing the functions, responsibilities, techniques, and relationships of each element in the Contractor's organization that implements the S/W quality program, including procurement, engineering, test, and quality control. (3) A schedule of SQA activities indicating their phase relationships with requirement analysis, design, Implementation, integration and test, and S/W reviews throughout the S/W life cycle. (4) A description of the SQA interfaces between JPL and the Contractor, between the Contractor and its suppliers, and between Contractor interdivisional quality organizations. (5) A description of how the Contractor will impose all SQA requirements by appropriate documents on all subcontractors and suppliers. (6) A description of the assumptions and preparation guidelines to be followed in generating the SQA analyses and review reports. (7) A SQA compliance matrix showing compliance to and deviations (if any) from JPL SQA requirements in MSL Mission Assurance Plan. (8) Description of how software safety/hazard/fault analysis activity will be implemented. 	

Contract No. ***	
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DATA REQUIREMENT DESCRIPTION	
TITLE: Electronic Parts Control Plan	NUMBER: MA-006
USE: To define the parts control activities.	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: MSL P-MAP, JPL D-27175
PREPARATION OF INFORMATION: The Contractor shall develop an Electronic Parts Control Plan that meets the requirements of the MSL Mission Assurance Plan. The plan shall describe the Contractor's Electronic Parts Implementation methods including references to Contractor's applicable policies, procedures, specifications and instructions. The plan shall also include: <ol style="list-style-type: none"> 1. Flow Down - How the parts requirements are flowed down to sub-tier Contractors 2. Management Requirements -The relationship of the Parts Organization to the Mission Assurance and Instrument Management team 3. GIDEP Alert implementation 4. Standard and Non-standard parts list review implementation process 5. Parts Review Board 6. Waivers 7. Parts Non-conformance process 8. Radiation Requirements and Testing Procedures 9. Parts Procurement Process 10. Parts Data Requirements and Data Retention 11. Parts Inspections (Customer Source Inspections and Incoming Inspections) 12. Handling and ESD Control 13. Failure Analysis - Root cause (failure) analysis implementation 	

Contract No. ***	
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DATA REQUIREMENT DESCRIPTION	
TITLE: Contamination Control Plan	NUMBER: MA-007
USE: Describes the requirements, documentation, analyses, evaluation, and testing of the contamination control methods used for flight hardware.	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: MSL P-MAP, JPL D-27175
PREPARATION OF INFORMATION: The Contractor shall prepare a Contamination Control Plan in accordance with the requirements in the MSL Mission Assurance Plan. The plan shall describe the Contractor's contamination control methods including references to Contractor's applicable institutional policies, procedures, specifications, and instructions. It shall also include the following: <ul style="list-style-type: none"> (1) Document Change Log (2) Table of Contents (3) Purpose, scope, and applicability of plan (4) List of applicable documents (5) A description of requirements, sources of requirements, and methodologies selected for implementing them. (6) A description of the Contractor Contamination Engineer's authority and responsibility with respect to meeting the Contamination Control Requirements delineated in JPL D-27175. (7) A description of fabrication, testing, storage, and shipment environments to be encountered by the deliverable hardware (8) A description of techniques and contamination control activities necessary for accomplishing Contamination Control Requirements (9) A description on the time allocation for contamination control activities (10) A description of how the Contractor will impose all requirements by appropriate documents on all subcontractors and suppliers including the assignment of responsibilities. 	

Contract No. ***	
Date: 3/4/05 , Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Materials and Processes Control Plan	NUMBER: MA-008
USE: Describes the requirements, documentation, analyses, evaluation and testing of the materials and processes used for flight hardware.	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: MSL P-MAP, JPL D-27175
PREPARATION OF INFORMATION: The Contractor shall prepare a Materials and Processes Control Plan in accordance with the Materials and Processes requirements in the MSL Mission Assurance Plan. The plan shall describe the Contractor's materials and process requirements and practices, including references to Contractor's applicable institutional policies, procedures, specifications, and instructions. It shall also include the following: <ol style="list-style-type: none"> (1) Document Change Log (2) Table of Contents (3) Purpose, scope, and applicability of plan (4) List of applicable documents (5) A description of the materials and processes engineering/assurance organization, management, approach, and responsibilities for accomplishing the various activities, as well as relationships to the elements of the Contractor's organization and its institutional organizations. (6) A description of the means for selection (including sources) of materials and processes, including criteria for qualification/evaluation plans. (7) A description of contents, use, and schedules for Materials Identification and Usage Lists (MIULs) and classifications of listed items; descriptions of the contents and use of Materials Usage Agreements (MUAs) and waivers; and templates for each of these forms. (8) A description of requirements, including sources, materials and processes selection criteria, and guidelines for implementation. (9) A schedule of materials and processes engineering/assurance activities indicating their phase relationships with design, development, procurements, design reviews, hardware reviews, fabrication, system testing, and shipment. (10) A description of responsibilities and techniques for accomplishing materials and processes engineering/assurance activities by or with subcontractors and suppliers. (11) A description of how the Contractor will impose all requirements by appropriate documents on all subcontractors and suppliers. 	

Contract No. ***	
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DATA REQUIREMENT DESCRIPTION	
TITLE: Reliability Data	NUMBER: MA-009
USE: To provide reliability data to the proposed designs.	PROJECT: MSL
INTERRELATIONSHIP: MA-001, MA-002	REFERENCES: MSL P-MAP (JPL D-27175), JPL D-8545, JPL D-5703
<p>PREPARATION OF INFORMATION:</p> <p>Data to be submitted, as defined by the approved Reliability Assurance Plan (MA-002), in accordance with JPL D-5703, or other approved source:</p> <ol style="list-style-type: none"> (1) Part Parameter Database (2) Thermal, radiation, voltage, and life parametric degradation assumptions (3) Electronic design schematics (4) Electronic parts stress analyses (derating parameters from JPL D-8545 or other approved source) (5) Thermal and structural stress analyses (6) Worst case circuit analyses (7) Worst case power supply analysis (8) Single event effects (SEE) analyses, including single event upset, single event latchup, single event transient. (9) Electrical ground support equipment interface FMEAs, Spacecraft Interface FMECA. (i.e., GSE-to-TDS and TDS-to-Spacecraft). (10) Mechanical/electromechanical fault tree analyses 	

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DATA REQUIREMENT DESCRIPTION	
Title Problem/Failure Reports (P/FRs)	NUMBER: MA-010
USE To provide JPL with timely notice of anomalies, problems or failures with the Contractor's software or hardware. Also, to provide JPL with the data necessary to assess the adequacy of the analysis and corrective action, so as to prevent recurrence of anomalies, problem/failures and to assess the residual risk following corrective action.	PROJECT: MSL
INTERRELATIONSHIP MA-001, MA-003	REFERENCES MSL P-MAP, JPL D-27175
PREPARATION INFORMATION: Each anomaly/problem/failure report shall be submitted in accordance with the JPL approved Problem/Failure Reporting Plan, MA-004, and shall be responsive to the requirements of the MSL Mission Assurance Plan. The reports shall include but not be limited to the following: <ol style="list-style-type: none"> (1) Complete identification of the hardware/software; (2) Date the anomaly, Problem/failure occurred; (3) Estimated operating hours and/or cycles at the time the problem/failure occurred; (4) Location of the hardware at occurrence; (5) Hardware environmental conditions when the problem/failure occurred; (6) Test/operation being performed; (7) A description of the problem/failure incident and the potential impact on the assembly/subsystem/system functional performance; (8) A description of the problem/failure analysis, including impact on hardware/software; (9) Cause of the problem/failure; (10) A description of the corrective action taken; (11) A description of the method used to verify that the corrective action was effective (12) Safety rating; (13) Numeric rating of the failure risk (confidence in the effectiveness of the corrective action) on the Contractor's hardware; (14) Supporting material shall be provided to allow JPL to perform the mission risk assessment; (15) Appropriate closeout signatures. 	

Contract No. ***	
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DATA REQUIREMENT DESCRIPTION	
TITLE: Electronic Parts Data	NUMBER: MA-011
USE: To provide parts data to the proposed designs.	PROJECT: MSL
INTERRELATIONSHIP: MA-001, MA-012	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION OF INFORMATION:</p> <p>The Contractor shall submit technical data as defined by MSL Mission Assurance Requirements Plan and the Contractor's Parts Program Plan, developed in accordance with DRD MA-012, which covers item selection, application status and problems/concerns during selection, procurement, design/development, fabrication and testing.</p> <p>These data shall consist of the following:</p> <ol style="list-style-type: none"> 1) Parts lists of all parts used in the Instrument Electronics, including those used in hardware procured from subcontractors and vendors, consisting of: <ol style="list-style-type: none"> a) Preliminary design lists include the following: <ul style="list-style-type: none"> Generic part number Manufacturers part number Manufacturer Part description (part type) Value/tolerance/rating Part specification/source control drawing number and revision letter Application usage notes and radiation data submitted Applicable NSPAR review and approval status Applicable Waiver review and approval status b) As-designed lists (same information as preliminary design lists). c) As-built lists (same as as-designed list with the following additional information: <ol style="list-style-type: none"> 1) Actual procurement part number and revision letter of each item. 2) Schematic reference designation where each part is used. 3) Schematics 3) Serial number of part (if serialized). 4) Screening/demonstration/upgrade lot number, as applicable. 5) Manufacture lot date code. 6) Traceability number as applicable. 7) Serial number and part number of the next assembly into which the part is installed. 8) Wafer and wafer lot (when applicable) 2) Non-standard Part Approval requests (NSPARs) and all associated procurement and screening/demonstration (test) documentation. 3) Waivers and all associated backup information. 4) Failure Analysis Reports. 5) Contractor -prepared parts specifications. 	

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Date:3/4/05 , Page 2 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Electronic Parts Data	NUMBER: MA-011
USE: To provide parts data to the proposed designs.	PROJECT: MSL
INTERRELATIONSHIP: MA-001, MA-012	REFERENCES: MSL P-MAP, JPL D-27175
<p>6) Periodic quarterly status reports for all electronic parts program activities, including parts list submittals/reviews, NSPAR/waiver processing, part procurement status, issues/resolutions, failure analyses results, response to GIDEP alerts, and all test results [screening, demonstration, upgrade, Total Ionizing Dose (TID) & Single Event Effect (SEE)].</p>	

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DATA REQUIREMENT DESCRIPTION	
TITLE: Materials and Processes Data	NUMBER: MA-012
USE: Lists and provides data, plans, and reports pertaining to the materials and processes that are to be used in the design and fabrication of flight hardware.	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION INFORMATION:</p> <p>Prepare and submit data in accordance with the following:</p> <ol style="list-style-type: none"> (1) Materials Identification and Usage Lists (MIULs) for all mechanical parts, electronic parts, materials and processes that are to be used in the design and fabrication of flight hardware. Information that shall be provided in the MIULs is described in JPL D-xxxx. The evaluation and selection of materials and processes for inclusion in the MIULs shall be according to the requirements and guidelines of JPL D-xxxx. The Contractor shall prepare the form using the attached MIUL template or the Contractor's equivalent document (2) Contractor preferred fasteners list (3) Contractor fastener selection and traceability requirements (4) Materials Usage Agreements (MUAs) or waivers that pertain to material and process issues, and all associated back-up information. The Contractor shall prepare the form using the attached two-page MUA form template or the Contractor's equivalent document (5) Failure analysis reports, which involve material and process issues 	

Contract No. ***	
Date: 3/4/05 , Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE Environmental Test Data and Reports	NUMBER: MA-013
USE To provide test data and reports to assure validation of all environmental test requirements. To provide visibility and review of environmental test documentation to ensure satisfaction of test requirements, test consistency, and traceability.	PROGRAM MSL
INTERRELATIONSHIP	REFERENCES P-MAP, JPL D-27175
PREPARATION INFORMATION 1. <u>Environmental test documentation</u> in accordance with MSL ERD, JPL D-21382 as follows: <ol style="list-style-type: none"> <u>Environmental Analysis Completion Statement (EACS)</u> [JPL Form 2566]: One for each required environmental analysis; all detailed supporting information to be appended to the form. <u>Radiation Analysis Completion Statement (RACS)</u> [JPL Form 2800]: One form for each h/w requiring radiation analysis; all detailed supporting information to be appended to the form. <u>Environmental Test Authorization and Summary (ETAS)</u> – Part one Authorization section [JPL Form 2683]: Consists of a checklist of environmental tests to be performed on the specified test article. One form to be completed for each test article, unless retesting is required (one for each re-test). <u>Environmental Test Authorization and Summary (ETAS)</u> – Part two, Summary Section [JPL Form 2683]: Summary of environmental test, durations, test dates, etc., performed on the specified test article. One form to be completed for each test on the specified test article. Preparation instructions are on the back of the form. <u>Environmental Test Reports</u> that state the results of the tests, as well as any anomalies, discrepancies, or failures (referencing relevant P/FRs as a result of these tests), etc., encountered during the test, “as tested” specification and explanation of any differences between the ETAS and “as tested” specifications and pass/fail status for each phase of the test. 	

Contract No. ***	
Date: 3/4/05 , Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Contamination Susceptibility Analysis	NUMBER: MA-014
USE: Describes and documents analyses performed to evaluate contamination susceptibility and derivation of cleanliness requirements from mission performance parameters.	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION OF INFORMATION:</p> <p>The Contractor shall prepare a Contamination Susceptibility Analysis. The analysis shall include the following:</p> <ol style="list-style-type: none"> 1) Identification of all, internal and external contamination-sensitive surfaces. 2) Specification of performance parameters affected by contamination 3) Susceptibility to organic molecular, particulate contamination, and any other “contaminants” originating from ground processing, flight or operations sources which may be of concern to the instrument 4) Quantification of self-contamination contribution to overall mission contamination budget. 5) Assessment of the flux of contamination from the external induced environment to instrument apertures and any other exposed contamination-sensitive surfaces to determine the effect on mission performance. Evaluate the need for flight-deployable covers, decontamination heaters, operational scenarios, or other mitigations and implement these, as needed, to meet end of life (EOL) performance requirements. 6) Internal and external cleanliness requirements related to, and derived from, mission performance requirements 7) Interior and exterior cleanliness levels to be achieved at BOL (beginning of life) 8) External cleanliness requirements to be maintained during ground processing—integration with spacecraft, space vehicle environmental testing, launch vehicle integration. 	



DATA REQUIREMENT DESCRIPTION

TITLE: Quality Assurance Data and Documentation	NUMBER: MA-015, rev 01/28/05 Page 1 of 1
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USE: To provide the documents that define the details of the Contractor's Quality Assurance activities.	PROGRAM MSL
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INTERRELATIONSHIP: MA-001; MA-004	REFERENCES: MSL P-MAP, JPL D-27175
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PREPARATION INFORMATION:

The Contractor shall prepare and submit Quality Assurance Data and shall submit or make available Quality Assurance Supporting Documentation for JPL's review and approval in accordance with the JPL-approved Contractor's Mission Assurance Plan, MA-001 or Quality Assurance Plan, MA-004 as follows:

A. Quality Assurance Data

- 1) Manufacturing, Inspection, and Test Flow Plan showing the fabrication and test flow of the hardware including the JPL mandatory source inspection points.

B. Quality Supporting Documentation

Submit documents or make available for JPL's review at Contractor's facility.

- 1) Flight Workmanship Standards
- 2) Critical Process Instructions
- 3) ESD Plans and Procedures
- 4) Storage, handling and shipping procedures

Contract No. ***	
Date: /2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Software Safety/Hazard/Fault Analysis Plan and Report	NUMBER: MA-016
USE: To describe the Contractor's software safety/hazard/fault analyses plan and results.	PROJECT: MSL
INTERRELATIONSHIP: CM-003, MA-001, MA-005, SS-001	REFERENCES: MSL P-MAP, JPL D-27175
<p>PREPARATION OF INFORMATION:</p> <p>The Contractor shall prepare a Software Safety/Hazard/Fault Analysis Plan and Report in accordance with the SQA requirements in MSL Mission Assurance Plan for safety critical software. The plan shall include the following:</p> <ol style="list-style-type: none"> (1) Purpose, scope, and techniques used (2) Interpretation of applicable safety requirements and methods of implementation (3) Functions, responsibilities, and relationships to system level safety and fault analyses (4) Software Safety/Hazard/Fault Analysis Schedules (5) Software Safety/Hazard/Fault Analysis Reporting (6) Mitigation identification, tracking, and verification <p>The software safety/hazard analysis report shall include the following:</p> <ol style="list-style-type: none"> (1) Description of hazard condition (including system, subsystem or unit where hazard resides, and operational phase when hazardous) (2) Hazard causes (3) Hazard effect (4) Hazard level (probability and severity) (5) Hazard detection method (6) Hazard control (7) Related system hazard and safety requirements (8) Responsible group or person for ensuring safeguards provided (9) Safety verification method (10) Status of verification (11) Other proposed and necessary actions (12) Approval signature <p>The report for software fault analysis shall document selected software fault analysis techniques and results (e.g., causes of hazards by Software Fault Tree Analysis, or results of Software Failure Modes Effect and Criticality Analysis for the identified software failure modes including effect of each failure mode, criticality, failure detection method, and failure correction method).</p>	

Contract No. ***	
Date: 4/2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Experiment Implementation Plan	NUMBER: MS-001
USE: The Plan provides the basis for Contractor's cost proposal for Implementation (Phase A-D).	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES: MSL PIP, D-27202
PREPARATION INFORMATION: Reference: Mars Science Laboratory Proposal Information Package, Section 7.4.4.2	

Contract No. ***	
Date: 4/2/2004, Page 1 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Earned Value/Resource Management Plan	NUMBER: MS-002
USE: Provides an overview of the management processes for work organization and for schedule cost planning and control; provides the documentation required to demonstrate compliance with JPL's Earned Value Management requirements.	PROJECT: MSL
INTERRELATIONSHIP: All other MS documents	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>(1) The responsibilities and methods needed to meet these requirements, plus any additional procedures the Contractor deems necessary to adequately manage its Earned Value and Resources, shall be documented in an Earned Value/Resource Management (EVRM) Plan, or equivalent. While the EVRM Plan shall cover Phases A–E, the Contractor is required to implement Earned Value during Phase C/D only.</p> <p>(2) The Contractor shall describe the management system to be used to:</p> <ol style="list-style-type: none"> Organize and clearly describe the work to be performed to meet the Contractual requirements; Schedule and budget the work; and Monitor and control cost performance and schedule progress during the Contract. <p>(3) Specifically, the Contractor's EVRM Plan shall include, but not be limited to:</p> <ol style="list-style-type: none"> A narrative description of the following processes: <ol style="list-style-type: none"> Work Definition/Organization Scheduling Budgeting and Baseline Change Control Work Authorization Actual Cost Collection Monthly Earned Value measurement and assessment Reporting of monthly EVM data to internal management (Phase C/D only) Subcontract monitoring and material cost control <p>As appropriate provide graphic examples, i.e., flow charts, diagrams, report formats, etc., of the processes described above.</p> <ol style="list-style-type: none"> Specific discussion of Item (3)(a)(iii) above to include: <ol style="list-style-type: none"> The processes used to integrate the Project Schedule (milestones and activities) with the Baseline Cost Estimate; The lowest applicable Work Breakdown Structure (WBS) level at which cost and schedule integration occurs in the Contractor's EVM system; The establishment and use of a Budget Transaction Log; The processes and controls used to establish and distribute Undistributed Budget and Management Reserve; The processes and controls used to implement authorized Contract changes into the Baseline Cost Estimate. 	

Contract No. ***	
Date: 4/2/2004, Page 2 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Earned Value/Resource Management Plan	NUMBER: MS-002
USE: Provides an overview of the management processes for work organization and for schedule cost planning and control; provides the documentation required to demonstrate compliance with JPL's Earned Value Management requirements.	PROJECT: MSL
INTERRELATIONSHIP: All other MS Documents	REFERENCES:
<p>PREPARATION INFORMATION (cont.):</p> <ul style="list-style-type: none"> c. Specific discussion of Item (3)(a)(vi) above to include: <ul style="list-style-type: none"> i) The methods for computing earned value at the lowest applicable WBS level, and the criteria for their usage (Phase C/D only); ii) The policy which requires establishment of discrete means of earned value measurement for all appropriate tasks, and which limits the level-of-effort method of earned value measurement to only those tasks which cannot be measured discretely (Phase C/D only); iii) The methods used to identify and implement corrective actions in response to variances; iv) The methods used to project the Contract cost Estimate-At-Completion (EAC) for both direct and indirect costs. d. Specific discussion of Item (3)(a)(viii) above to include: <ul style="list-style-type: none"> i) The method used for scheduling subcontract and material procurements; ii) The method used for subcontract and material cost budgeting; iii) The method used for subcontract and material earned value measurement (Phase C/D only); iv) The method used to recognize subcontract and material actual costs; v) The procedure for analyzing material price and usage variances; and vi) The procedure for analyzing subcontract cost and schedule variances. e. Identification of personnel (either by name or by functional title) who are responsible for planning the work and reporting work progress. Also identify individuals responsible for reviewing reported accomplishments, monitoring the EVM activities (Phase C/D only), and verifying earned value calculations. <p>After initial JPL approval, the Earned Value / Resource Management Plan shall be modified only with the prior consent of JPL.</p>	

Contract No. ***	
Date: 4/2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Experiment Operations Plan (EOP)	NUMBER: MS-003
USE: The Plan provides the basis for Contractor's cost proposal for Operations (Phase E).	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>The Contractor shall prepare an Experiment Operations Plan (EOP) that describes the Contractor's approach to providing post-launch mission operations support.</p> <p>The implementation plan shall be correlated to the WBS (MS-004) and shall identify cost and schedule plans, plus deltas, with rationale from the previous baseline.</p> <p>The Plan shall include as a minimum the following:</p> <ol style="list-style-type: none"> (1) Purpose and Scope (2) Personnel Roles and Responsibilities <ol style="list-style-type: none"> 2.1 General 2.2 Science Team 2.3 Project Administration 2.4 Mission Operations 2.5 Data Calibration and Processing 2.6 Data Archiving and Distribution 2.7 Software Development and Maintenance 2.8 Science Analysis and Validation 2.9 Education and Public Outreach 2.10 Investigation Scientist 2.11 Participating Scientists (3) Project Interfaces (4) Requirements fro Government-Furnished Support (5) Science Team support and Data Analysis <ol style="list-style-type: none"> 5.1 Organization and Responsibilities 5.2 Project Administration plan 5.3 Mission operations plan 5.4 Data Calibration and Processing Plan 5.5 Data Archiving and Distribution Plan 5.6 Software Development Plan 5.7 Facilities and Hardware (6) Schedules, Deliverables, and Services (7) Cost Plan 	

Contract No. ***	
Date: 4/2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Work Breakdown Structure and Dictionary	NUMBER: MS-004
USE: The Work Breakdown Structure (WBS) and Dictionary establishes the basic framework within which all effort necessary to meet the requirements of the Contract is identified and defined. It provides the logical structure for planning and controlling costs.	PROJECT: MSL
INTERRELATIONSHIP: Schedules Baseline Cost Estimate Financial Reports	REFERENCES:
PREPARATION INFORMATION: <p>The purpose of the WBS is to provide a logical framework that organizes program budgets and schedules. It shall be presented in both tabular and graphic form and shall be an expansion of the summary WBS provided by JPL, if any, and shall be product-oriented.</p> <p>The lowest level of the WBS shall correspond to at least the lowest level at which work scheduled and actual costs can be compared. This level shall be agreed upon during contract negotiations. The WBS shall be coded to establish the relationship among all of its levels. The established coding shall be used to identify each particular WBS item on all program budgets, schedules and financial reports. The WBS shall indicate which items require monthly financial reporting.</p> <p>A WBS Dictionary shall be prepared to define each item of the WBS. These definitions shall describe the work to be performed, the criteria for completing the work, the organization responsible for the work and the major deliverable(s) involved (if applicable).</p> <p>After initial approval, the WBS and Dictionary shall be modified only with the prior consent of JPL.</p>	

Contract No. ***	
Date: 4/2/2004, Page 1 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Baseline Earned Value, Cost, Schedule and Workforce Report	NUMBER: MS-005
USE: To provide baseline detailed earned value, cost, schedule, and workforce data against which progress will be assessed.	PROJECT: MSL
INTERRELATIONSHIP: All other MS documents	REFERENCES:
PREPARATION INFORMATION: <ol style="list-style-type: none"> 1) The Contractor shall establish, within his organization, responsibility for implementing the baseline earned value, cost, schedule and workforce report requirements specified in this Contract. The responsibilities and methods needed to meet these requirements, plus any additional procedures the Contractor deems necessary to adequately report the baseline earned value, cost, schedule, and workforce, shall be documented in an Earned Value/Resource Management Plan, or equivalent. 2) The Report shall include the following: <ol style="list-style-type: none"> a. Basis of Estimate for each Cost Account planned (Phase C/D). The Contractor is required to submit a Baseline Resource Plan Report in Phase A/B b. Schedule <ol style="list-style-type: none"> i) CPM program detailed master network schedule comprising tasks and milestones that depict all work activities and procurements under this Contract. <ul style="list-style-type: none"> Identified schedule margins (slack) in accord with JPL D- *** In mutually agreed to templates Identified predecessor-successor task relationships ("receivables/deliverables") where such relationships cross WBS boundaries Including tasks which are identified as "receivables" or "deliverables" from external sources such as instrument or GFP providers ii) Program Level 1/2 rollup schedule in TBN electronic format iii) Other data used for managing and reporting baseline schedules to internal management c. Workforce <ol style="list-style-type: none"> i) Planned Full Time Equivalents (FTE) d. Bill Of Material indicating the major TBS subcontracts <ol style="list-style-type: none"> i) Supplier name, ii) Estimated price, and iii) Estimated definitization dates. e. Long-lead items to be procured during Phase A/B <ol style="list-style-type: none"> i) Supplier name, ii) Estimated price, and iii) Estimated definitization dates. 	

Contract No. ***	
Date: 4/2/2004, Page 2 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Baseline Earned Value, Cost, Schedule and Workforce Report	NUMBER: MS-005
USE: To provide baseline detailed earned value, cost, schedule, and workforce data against which progress will be assessed.	PROJECT: MSL
INTERRELATIONSHIP: All other MS documents	REFERENCES:
PREPARATION INFORMATION (contd.): <ul style="list-style-type: none"> f. Budget Reserve <ul style="list-style-type: none"> i) Budget reserves expenditure plan ii) Recommended JPL held budget reserves and rationale therefore for each subsystem element. g. Schedule Margin <ul style="list-style-type: none"> i) Schedule Margin expenditure plan in accord with JPL D- *** 	

Contract No. ***	
Date: 4/2/2004, Page 1 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Detailed Earned Value, Cost, Schedule and Workforce Status Reports	NUMBER: MS-006
USE: To provide the Detailed Earned Value, Cost, Schedule and Workforce periodic reporting criteria.	PROJECT: MSL
INTERRELATIONSHIP: All other MS documents	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>Transmittal in the MMR package or by inclusion on the server is acceptable.</p> <p>(1) The Report shall include the following:</p> <ul style="list-style-type: none"> a. Schedule <ul style="list-style-type: none"> i) CPM program detailed master network schedule comprising tasks and milestones that depict all work activities and procurements under this Contract. <ul style="list-style-type: none"> Identified schedule margins (slack) in accord with the JPL D- 17868 Mutually agreed to templates Identified predecessor-successor task relationships ("receivables/deliverables") where such relationships cross WBS boundaries Including tasks which are identified as "receivables" or "deliverables" from external sources such as instrument or GFP providers ii) Program Level 1/2 rollup schedule in TBN electronic format iii) All other schedules generated for managing and reporting status to internal management. b. Schedule metrics <ul style="list-style-type: none"> i) Milestone trend charts, format TBS ii) Slack tables, format TBS, iii) Critical path tables, format TBS, iv) Schedule margin plan vs. consumption, v) All other schedule metrics generated for managing and reporting status to internal management. c. Significant schedule changes <ul style="list-style-type: none"> i) Schedule slack, ii) Critical path d. Schedule recovery plans 	

Contract No. ***	
Date: 4/2/2004, Page 2 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Detailed Earned Value, Cost, Schedule and Workforce Status Reports	NUMBER: MS-006
USE: To provide the Detailed Earned Value, Cost, Schedule and Workforce periodic reporting criteria	PROJECT: MSL
INTERRELATIONSHIP: All other MS Documents	REFERENCES:
<p>PREPARATION INFORMATION (cont.):</p> <ul style="list-style-type: none"> e. Cost Management metrics for each system level Cost Account <ul style="list-style-type: none"> i) Cost Variance, ii) Schedule Variance (Phase C/D only), iii) Schedule Performance Index (Phase C/D only), iv) Cost Performance Index, To-Complete Performance Index (Phase C/D only), f. Significant EVM/Cost Management changes <ul style="list-style-type: none"> i) In Cost Management metrics as identified in "e" above. g. Cost Management recovery plans h. Workforce (MMR) <ul style="list-style-type: none"> i) Plan vs. actual Full Time Equivalents (FTE) i. Bill Of Material indicating the status of major subcontracts (MMR) <ul style="list-style-type: none"> i) Supplier name, ii) Estimated vs. actual price, iii) Negotiations status, and iv) Estimated definitization dates j. Long-Lead items to be procured during Phase A/B (MMR) <ul style="list-style-type: none"> i) Supplier name, ii) Estimated vs. actual price, iii) Negotiations status, and iv) Estimated definitization dates k. Budget Reserve <ul style="list-style-type: none"> i) Budget reserves remaining vs. estimated cost-to-go l. Liens/Threats list <ul style="list-style-type: none"> i) Soft <ul style="list-style-type: none"> identifying known or perceived programmatic and technical risk items including a ROM cost for each item, should it occur including a ROM probability of its occurrence (low, medium or high). ii) Hard <ul style="list-style-type: none"> Identifying item to which reserves were applied Identifying the definitized, time-phased allocated cost 	

Contract No. ***	
Date: 4/2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Contract Status Report	NUMBER: MS-007
USE: To provide commitment, cost, and overhead cost information for performance measurement and evaluation.	PROJECT: MSL
INTERRELATIONSHIP: All other MS Documents	REFERENCES: NASA Forms 533M and 533Q NPG 9501.2D
<p>PREPARATION INFORMATION:</p> <p>(1) The Report shall include:</p> <ul style="list-style-type: none"> a. NASA Form 533M (submitted monthly) and 533Q (submitted quarterly) completed in accordance with the instructions in NPG 9501.2D. The 522M and 533Q reports shall be prepared at Levels 1 and 2 of the WBS. Reporting categories on each shall be the elements of cost (e.g., labor hours, labor dollars, overhead, material, subcontracts, other direct cost, G&A, cost of money) and profit or fee. b. A monthly Overhead Report submitted with the 533M report which provides the following information: <ul style="list-style-type: none"> i) A listing of the latest bidding, billing, and actual incurred overhead and G&A rates by cost centers. ii) A copy of, or comments regarding, any new rate approvals by the cognizant DCAA office. iii) A delineation of the rates, by cost centers, used in preparation of the 533M and 533Q reports. c. A monthly total commitment and total cost profile. d. A reconciliation report shall be prepared in accordance with instructions in NPG 9501.2D. e. The potential termination liability (PTL) shall be identified as well as a projection of the PTL for the current and subsequent government fiscal year. 	

Contract No. ***	
Date: 4/2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Subcontracting Report for Individual Contracts	NUMBER: MS-008
USE: Provides data on the implementation of the Contractor's Small Business/Small Disadvantaged Business Subcontracting Plan	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES: Standard Forms 294 and 295
PREPARATION INFORMATION: Prepare a Subcontracting Report for Individual Contracts (Standard Form 294 and 295) in accordance with the instructions on the reverse side of the Form.	

Contract No. ***	
Date: 4/2/2004, Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Monthly Management Reviews	NUMBER: RE-001
USE: Provides monthly status briefing and materials to identify and resolve technical, business, and management issues.	PROJECT: MSL
INTERRELATIONSHIP: MS-001, MS-002, MS-004, MS-005, MS-006	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>The MMR shall include a presentation by each subsystem or equivalent (nominally WBS level 3) consisting of, as a minimum, the following:</p> <ol style="list-style-type: none"> (1) Progress during past reporting period vs. plan (2) Discussion of activities not accomplished (3) List of activities planned for next reporting period (4) Brief discussion of problems/concerns (5) Schedule status and variance from baseline discussion, including Gantt schedules and slack tables (showing previous data, current data and delta Total Float) (6) Cost discussion including comparison of actual and planned cost, earned value analysis, and an explanation of variances that exceed 10% or \$25,000 at the cost account level (7) Technical/design status, including key requirements, expected performance and design margins; major trade studies and progress; design verification activities (analyses, breadboards, testbeds, etc.); major technical issues; interface definition progress and issues; parts selection, approval and procurement progress; reliability analyses progress and issues; test results, summary of new and open waivers and ECRs against spacecraft specification; and problem/failure report status (8) Implementation progress including procurement and subcontract status and issues (9) Summary of current risk items and potential mitigations (10) Splinter meeting highlights and action items as applicable (11) Summary of internal liens list <p>In addition, the MMR shall include program management and mission assurance summaries addressing as appropriate the above themes; and a contract status summary including deliverables status, items requiring JPL approval, contract modifications status, authorized level-of-effort tasks, status and hours balance, contract issues and problems and Contractor billing and JPL payment status.</p> <p>The Contractor shall also prepare minutes of the MMR including:</p> <ol style="list-style-type: none"> (1) Modifications, corrections or revisions to presented material (2) Significant material or data presented but not covered in the handouts (3) Significant statements of policy or procedures; or commitments made by JPL or Contractor management (4) Updated action item list reflecting closures and new items identified in the MMR 	

Contract No. ***	
Date: 3/4/05 , Page 1 of 3	
DATA REQUIREMENT DESCRIPTION	
TITLE: Preliminary Design Review (PDR)	NUMBER: RE-002
USE: The preliminary design review evaluates the readiness of the Instrument to proceed with detail design. It assesses the compliance of the design with applicable requirements.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <ol style="list-style-type: none"> 1) Scope - This review addresses all design aspects related to development and mission operations. <ol style="list-style-type: none"> (a) Design specifications. (b) Preliminary descriptions of the form, fit, function, and performance of the product or process to be fabricated or programmed. (c) Analysis of the design of the product. (d) Results of the testing and evaluation of earlier models or prototypes of the product or process. (e) Preliminary fabrication or programming instructions or processes. (f) Preliminary test plans and procedures for the stand-alone testing of the product or process. (g) Cost estimates. 2) Timing - This is an instrument review held at the conclusion of the definition phase of the product or process being reviewed. 3) Success Criteria - The review board is able to conclude that: <ol style="list-style-type: none"> (a) The preliminary designs and processes meet the requirements and are sufficiently defined, documented, and controlled to proceed with the detail design within the risk policy of the project. (b) Plans for resolving any open items and unresolved problems are consistent with available resources and risk policy. (c) Requirements and design are compatible with operability and availability objectives. The operations concept is reasonable and acceptable. (d) The functional definitions for all interfaces are proceeding at an acceptable rate. (e) The make/buy decisions and contracting decisions are reasonable and acceptable. (f) The requirements and design are testable. (g) The test approach and product status is thorough and acceptable. (h) The life-cycle implementation approach, the planning, schedule, and cost estimates are reasonable and justifiable. 4) Topics <ol style="list-style-type: none"> (a) General. <ol style="list-style-type: none"> (1) Description of product or process. (2) Summary of the results from previous reviews, including the status and resolution of action items. (3) Summary of lower-level preliminary design reviews and peer reviews, including the status and closure of action items. (4) Risk assessment. 	

Contract No. ***	
Date: 3/4/05 , Page 2 of 3	
DATA REQUIREMENT DESCRIPTION	
TITLE: Preliminary Design Review (PDR)	NUMBER: RE-002
USE: The preliminary design review evaluates the readiness of the Instrument to proceed with detail design. It assesses the compliance of the design with applicable requirements.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>(b) Product design.</p> <ol style="list-style-type: none"> (1) Requirements traceability and compliance matrix. (2) Configuration and design of all hardware and software elements, including block diagrams and flow diagrams. (3) Preliminary electrical, mechanical, structural, and thermal design. (4) Function and performance as compared to requirements, including cost. (5) Error budgets. (6) Performance margins relative to required performance (e.g., mass, power, error rate, memory capacity). (7) Design prototyping results. (8) Inheritance and dependency assessments. (9) Conformance to environmental design, product quality assurance requirements. (10) Interface design. (11) Design trade-offs, alternatives, and selection basis. (12) Safety analysis, including analyses of structural stress, fracture control, and thermal properties. (13) Reliability analyses (e.g., stress, worst case, error traps). (14) Radiation susceptibility analysis and design (e.g., single-event upsets). (15) Implementation constraints, including hardware and software standards. (16) Compatibility with safety, maintainability, availability, operability, reliability, and quality assurance objectives. (17) Make/buy trades, contracting alternatives, trade-offs, and decisions. <p>(c) Preliminary manufacturing process design.</p> <ol style="list-style-type: none"> (1) Manufacturing plans and processes. (2) Parts, materials, and processes list. (3) Long lead item procurement status. (4) Electronic parts classifications. (5) Documentation plans and controls. (6) Implementation schedule and resources plans. (7) Data management and configuration control plans. (8) Test instrumentation requirements and design. (9) Product assurance process. (10) Hardware and software development schedules, including verification tests or analysis to be performed. (11) Parallel developments, if any. 	

Contract No. ***	
Date: 3/4/05 , Page 3 of 3	
DATA REQUIREMENT DESCRIPTION	
TITLE: Preliminary Design Review (PDR)	NUMBER: RE-002
USE: The preliminary design review evaluates the readiness of the Instrument to proceed with detail design. It assesses the compliance of the design with applicable requirements	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <ul style="list-style-type: none"> (d) Preliminary integration and testing approach <ul style="list-style-type: none"> (1) Approach to integration and testing, including test environment, tools. (2) Approach to operations testing. (3) Status of test requirements, test design, etc. (4) Test acceptance criteria. (e) Preliminary handling and shipping process design. <ul style="list-style-type: none"> (1) Facilities. (2) Fixtures. (3) Special tools. (4) Shipping containers. (5) Safety. (6) Human factors. (f) Preliminary operations support plan. <ul style="list-style-type: none"> (1) Preliminary higher-level system test plans. (2) Team structure. (3) Training (4) Spares (5) Logistics (g) Project planning and status. <ul style="list-style-type: none"> (1) Peer review results for project plans (2) Cost and schedule status and projections. (3) Transition plans. 	

Contract No. ***	
Date: 3/4/05 , Page 1 of 3	
DATA REQUIREMENT DESCRIPTION	
TITLE: Critical Design Review (CDR)	NUMBER: RE-003
USE: The instrument critical design review evaluates the readiness of the Instrument to proceed with development, including fabrication, assembly, integration, and test. It assesses the compliance of design with applicable requirements.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <ol style="list-style-type: none"> 1) Scope <ol style="list-style-type: none"> (a) Detailed descriptions of the form, fit, and function of the product or process to be fabricated or programmed. (b) Detailed analysis of the design of the product. (c) Results of the testing and evaluation of earlier models or prototypes of the product or process. (d) Detailed fabrication or programming instructions or processes. (e) Detailed test plans and procedures for the stand-alone testing of the product or process. (f) Detailed plans for handling the products. (g) Cost estimates, including cost of test program. 2) Timing - This review is held just prior to the fabrication or programming of the product or process. 3) Success Criteria - The review board is able to conclude that: <ol style="list-style-type: none"> (a) The designs and processes meet requirements and are sufficiently defined and documented to proceed within the risk policy of the project. (b) Plans for resolving remaining problems are consistent with available resources and risk policy. (c) The test approach and test product status is thorough and acceptable. 4) Topics <ol style="list-style-type: none"> (a) General. <ol style="list-style-type: none"> (1) Description of product or process. (2) Significant results of prior reviews. (3) Resolution of action items and issues from prior reviews, especially the preliminary design review. (4) Summary of lower-level critical design reviews and peer reviews, including the status and closure of action items. (5) Risk assessment. (6) Open issues requiring resolution. (b) Product design. <ol style="list-style-type: none"> (1) Requirements traceability and compliance matrix. (2) Configuration and design of all hardware and software elements, including block diagrams and flow diagrams. (3) Detail design (electrical, mechanical, structural, thermal). (4) Function and performance as compared to requirements including cost. (5) Error budgets. 	

Contract No. ***	
Date: 3/4/05 , Page 2 of 3	
DATA REQUIREMENT DESCRIPTION	
TITLE: Critical Design Review (CDR)	NUMBER: RE-003
USE: The instrument critical design review evaluates the readiness of the Instrument to proceed with development, including fabrication, assembly, integration, and test. It assesses the compliance of design with applicable requirements.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <ul style="list-style-type: none"> (6) Performance margins relative to required performance (e.g., mass, power, error rate, memory capacity). (7) Differences between the system and subsystem performance and margins relative to the performances estimated at the preliminary design review. (8) Test results for earlier models or prototypes. (9) Inheritance assessment. (10) Conformance to environmental design requirements. (11) Design trade-offs and alternatives considered, decisions made. (12) Parts, materials, and processes list. (13) Electronic parts classifications. (14) Detailed interfaces and cable design. (15) Safety analysis, including analyses of structural stress, fracture control, and thermal properties. (16) Reliability analyses (e.g., stress, worst case, error traps). (17) Radiation susceptibility analysis and design (e.g., single-event upsets). (18) Detailed analysis of failures. (19) P/FR status. (20) Maintainability, repairability, operability, and reliability. <ul style="list-style-type: none"> (c) Manufacturing process design. <ul style="list-style-type: none"> (1) Manufacturing plans and processes. (2) Long lead item status. (3) Documentation plans, controls, and status. (4) Data management and configuration control plans. (5) Product assurance process. (d) Integration, test, and qualification plans. <ul style="list-style-type: none"> (1) Approach to testing, including test environment, tools. (2) Test instrumentation requirements. (3) Calibration plans. (4) Alignment plans. (e) Handling and shipping process design. <ul style="list-style-type: none"> (1) Facilities. (2) Fixtures. (3) Special tools. (4) Shipping containers. (5) Safety (including electrostatic discharge control and contamination control). (6) Human factors. 	

Contract No. ***	
Date: 3/4/05 , Page 3 of 3	
DATA REQUIREMENT DESCRIPTION	
TITLE: Critical Design Review (CDR)	NUMBER: RE-003
USE: The instrument critical design review evaluates the readiness of the Instrument to proceed with development, including fabrication, assembly, integration, and test. It assesses the compliance of design with applicable requirements.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
PREPARATION INFORMATION:	
<div><div>(f) Operations support plan.<div><div>(1) Preliminary higher-level system test plans.</div><div>(2) Team structure.</div><div>(3) Training.</div><div>(4) Spares.</div><div>(5) Logistics.</div></div></div><div>(g) Project planning and status.<div><div>(1) Overview of new planning materials such as integration and test plan, training plan, operations support plan, and logistics/sparing/maintenance plan.</div><div>(2) Cost to complete estimates, including testing, installation, spares, logistics, sustaining/maintenance and cost justification.</div><div>(3) Work breakdown structure.</div><div>(4) Implementation schedule, time to complete estimate.</div><div>(5) Interdependencies with other projects.</div></div></div></div>	

Contract No. ***	
Date: 3/4/05 , Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Delivery Review (DR)	NUMBER: RE-005
USE: The delivery review evaluates the readiness of the Instrument for delivery to the Spacecraft, associated with transition to the ATLO phase.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <ol style="list-style-type: none"> 1) Scope <ol style="list-style-type: none"> (a) Status of all products and processes to be delivered. (b) Status of all supporting documentation. (c) Shipping and handling. (d) Readiness of receiving organization to accept delivery. (e) Safety. 2) Timing - This review is held sufficiently in advance of the delivery date to allow for correction of deficiencies. 3) Success Criteria - The review board is able to conclude that: <ol style="list-style-type: none"> (a) The products and processes to be delivered have been adequately tested to ensure that all requirements have been met. (b) The products and processes, associated documentation and special test equipment are ready for delivery. (c) A plan exists for closing all remaining problems, waivers, or liens. (d) The receiving organization is ready to accept delivery. 4) Topics <ol style="list-style-type: none"> (a) Status of all drawings, design specifications, and documentation (including engineering change requests). (b) Configuration of hardware or software being delivered versus other serial numbers of the same deliverables. (c) Compliance with all requirements. (d) Closure status of action items from prior reviews and discussion of all discrepancies (failure or problem reports), waivers, material review boards, and formal inspections. (e) Completion status of radiation, electrostatic discharge, and meteoroid shielding. (f) Results of qualification tests and environmental analyses. (g) Comparison of verification test matrix to test plans and procedures. (h) Comparison of requirements to verification test matrix. (i) Results of subsystem- and system-level functional testing and calibration. (j) Performance margins and uncertainties, including power, mass, memory, error rate, and consumables (k) Special control plans and procedures for fracture mechanics, stress corrosion, and material compatibility. (l) Contamination control. (m) Shipping and handling constraints, requirements, and plans. (n) Safety provisions and certification compliance. (o) Documentation and data required for end-item data package. (p) Transfer of licenses (e.g., for commercial off-the-shelf software). (q) Logistics. (r) Special test equipment and tools. (s) Spares. (t) Maintenance plan. (u) Installation procedures. 	

Contract No. ***	
Date: 3/4/05 , Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Operations Readiness Review (ORR)	NUMBER: RE-006
USE: The instrument operational readiness review evaluates the readiness of all systems, supporting facilities, operations procedures, and operations personnel.	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <ol style="list-style-type: none"> 1) Scope <ol style="list-style-type: none"> (a) Readiness of all systems, facilities, and teams. (b) Test results from all systems, facilities, and teams. (c) Compatibility of all systems, facilities, and teams. (d) Open P/FRs, waivers, liens, deviations, change requests, and inspection reports from all systems, facilities, and teams. 2) Timing - This review is held sufficiently in advance of operational use to allow time for correction of deficiencies. 3) Success Criteria - The review board is able to conclude that the flight systems, ground systems, supporting facilities, and operations personnel can accomplish all mission objectives. 4) Topics <ol style="list-style-type: none"> (a) Mission background and profile. (b) Requirements. <ol style="list-style-type: none"> (1) Launch-hold criteria. (2) Supporting elements. (3) Tracking and data acquisition. (4) Navigation. (5) Data processing. (6) Data archive. (c) Status of hardware, software, and transfer agreements. (d) Operations status. (e) Support configuration(s). (f) Communications network configuration. (g) Internal and external interfaces. (h) Test and training status and schedule(s). (i) Operations documentation status. (j) Critical-period special support plans. <ol style="list-style-type: none"> (1) Advisor support. (2) Configuration control. (3) Access control. (4) Backup power. (5) Communications special coverage. (6) Radio frequency interference avoidance. (7) Coverage schedule for critical period. (k) Acquisition plans. (l) Contingency strategies. (m) Security planning. (n) Open liens, anomalies, and problems. (o) Summary of results from previous reviews, including status and resolution of action items. (p) Project status. <ol style="list-style-type: none"> (1) Schedule and cost finals vs. plan. (2) Interdependencies with other projects. (3) Lessons learned. 	

DATA REQUIREMENT DESCRIPTION		
Contract No.:	Date: 3/4/05	Page 1 of 2
Title: Safety Plan	Number: SS- 001	
Use: To define and describe the Contractor's Safety Policy and Safety Data requirements	Program: Mars Science Laboratory (MSL)	
Interrelationship: MS-001	References: MSL P-MAP, JPL D-27175	
Preparation Information:		
The Contractor shall comply with the following requirements:		
1. <u>Experiment Safety Plan:</u>		
Contractor's existing Safety Plan(s), tailored to the MSL Project, may be submitted for JPL Systems Safety assessment of adequacy in meeting the intent of this document.		
The Project Safety Plan shall assure adequate safety for personnel, critical hardware, and ground support equipment. The safety plan shall address assembly, inspection, handling (including shipping), test, and operations conducted in all facilities (contractor, subcontractor, JPL, NASA centers, university, or others). In general, the contractor's Safety Plan shall be in keeping with the complexity and risk tolerance of the contract and shall clearly specify the level and scope of hardware safety to be implemented on the project. The plan shall include, as appropriate:		
<div><div>(1) Purpose and scope</div><div>(2) Interpretation of applicable safety requirements and methods of implementation</div><div>(3) Systems Safety Program (including all safety tasks)</div><div>(4) Project Organization (including Systems Safety reporting)</div><div>(5) System Safety Schedules (relative to contract/project milestones)</div><div>(6) System Safety outputs (including deliverable data)</div><div>(7) Hazard Analyses (when requested for MSPSP input)</div><div>(8) Hardware protection methods (eg: contamination, ESD, transportation, etc.)</div><div>(9) Required Training</div><div>(10) Audit Program</div><div>(11) Mishap Reporting and Investigation</div><div>(12) Safety oversight at sub-contractors</div></div>		
2. <u>Safety Data Package Inputs: (for F/S assemblies, GSE and Science Instruments)</u>		
Ground processing and in-flight hazards shall be identified as appropriate for this project. The responsibility for generation of data for incorporation into the Missile System Prelaunch Safety Package (MSPSP) will be specified in the contract. The Data Package input will, as a minimum, consist of the following:		
<div><div>(1) Description of assembly/sub-system, GSE, Science Instrument, etc.</div><div>(2) Mechanical Diagram</div><div>(3) Functional Block Diagram</div><div>(4) Description of hazards, controls and control verifications for hazard related items.</div><div>(5) Software Safety Critical Functions (SSFC) list and descriptions.</div></div>		

DATA REQUIREMENT DESCRIPTION		
Contract No.:	Date: 3/4/05	Page 2 of 2
Title: Safety Plan	Number: SS- 001	
Use: To define and describe the Contractor's Project Safety Policy and Safety Data requirements	Program: Mars Science Laboratory (MSL)	
Interrelationship: MS-001	References: MSL P-MAP, JPL D-27175	
<p><u>3. Safety Surveys:</u></p> <p>All operations or activities involving hazards to personnel and/or critical hardware shall be reviewed prior to initiating the operation or activity. The MSL Project Safety Engineer and/or contractor designee(s) shall conduct Facility Safety Surveys (FSS), Operations Safety Surveys (OSS) and Transportation Safety Surveys (TSS) to assure safety compliance and hardware protection. Contractor may use their equivalent forms or processes, providing all significant areas of safety are addressed. The following survey forms will be provided by JPL:</p> <p style="padding-left: 40px;">Systems Safety Surveys (SSS) - shall be performed to assure specific facilities and operations are appropriate for the planned flight hardware activities.</p> <p style="padding-left: 40px;">Transportation Safety Surveys (TSS) - shall be performed for all significant movements of flight hardware.</p> <p>Above forms are available (electronically or hard copy) from the JPL Systems Safety Office.</p> <p><u>4. Waivers, Exceptions, Deviations, and Nonconformances Processing</u></p> <p>Requirements specified in this document may be waived/excepted or deviated from when alternate methods are employed to achieve the required protection and the risk of injury to personnel or loss of or damage to hardware is acceptably low. Waiver approval authority rests only with the contract management authority that established the requirement in conjunction with the waiver review by Project Safety.</p>		

Contract No. ****	
Date: 3/4/05 , Page 1 of 1	
DATA REQUIREMENT DESCRIPTION	
TITLE: Safety and Health Plan	NUMBER: SS-002
USE: To define and describe the Contractor's Personnel Safety Policy and Reporting requirements	PROJECT: MSL
INTERRELATIONSHIP: MA-001	REFERENCES: JPL D-560; MSL P-MAP, JPL D-27175
<p>PREPARATION INFORMATION:</p> <p>The Contractor shall comply with the requirements of the MSL Project Safety Plan in addition to the Safety and Health Additional General Provisions (AGP) of this Contract.</p> <p><u>1. Safety and Health Plan:</u></p> <p>Prepare and submit, for JPL approval, a Safety and Health Plan in accordance with paragraph (d) of the AGP.</p> <p><i>The Safety and Health Plan shall describe the means to be employed by the Contractor to monitor and enforce their safety and health requirements. The plan shall also include the Contractor's standards and criteria for imposing safety and health standards upon its subcontractors of any tier and its plans and procedures for monitoring compliance with such standards.</i></p> <p>The Contractor's currently published Safety and Health Plan or a previously published plan for similar work performed by the Contractor on a federal contract may be submitted for JPL review and approval under this Contract.</p> <p><u>2. Illness, Incident, and Injury Experience Report:</u></p> <p>The Contractor shall immediately notify and promptly report to JPL any accident, incident or exposure resulting in fatality, lost-time occupational injury or occupational disease, contamination of property or property loss of \$25,000 or more arising out of work performed under this Contract in accordance with par (e) of the AGP.</p> <p>The Contractor shall submit such additional reports of illness, incident and injury experience reports as required by par (f) of the AGP.</p> <p><u>3. Hazardous Operations:</u></p> <p>The Contractor shall furnish a list of all hazardous operations to be conducted in the performance of this contract, in addition to written procedures relative to the completion of those operations in accordance with par (c) (2) of the AGP.</p>	

Contract No. ***	
Date: 3/4/05 , Page 1 of 4	
DATA REQUIREMENT DESCRIPTION	
TITLE: Functional Requirements Document (FRD)	NUMBER: SE-001
USE: This presents detailed guidelines for the preparation of both preliminary and final instrument (Level-4) Instrument Functional Requirements Document (FRD).	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>These guidelines have been assembled for preparing the final Project FRDs. Their purposed is to establish uniformity in organization and detail. They will also be the guidelines by which the documents will be reviewed. Many of these guidelines have been extracted from existing JPL project documentation.</p> <p>General Guidelines:</p> <ol style="list-style-type: none"> 1. The verb "shall" is to be used in all parts of the FR, except as stated in paragraph 2, below. This applies to the actual requirements section (3.0), as well as to the descriptive material (4.0), performance parameters (6.0), and physical characteristics and constraints (7.0). 2. The verb "will" is to be used only when referencing something to be provided by another subsystem that is required for the proper operation of subject subsystem 3. The only requirements that may be expressed in Instrument FRDs are those on the subject subsystem covered by the functional requirement. These requirements are to be explicitly and concisely stated. 4. Requirements on subsystems other than the subject subsystem of the Instrument FRD are to be incorporated in the Science Requirements Document (SRD). If there are any Level-3 requirements, these should be identified to the Payload Manger and Project System Engineer in writing as expressed in the project change control guidelines. 5. Numerical values that control or describe functional or system parameters are to be expressed in the International System of Units (SI) and may, in addition, include U.S. Customary units. If the FR contains measurements in SI units that control or describe hardware configurations, equivalent U.S. Customary units are to be given. If both systems are used, the SI Units are to be followed by the equivalent U.S. Customary Units in parentheses. 6. The table of contents should reference all paragraphs in the FRD, but page number references are not required. 7. Abbreviations used within the text shall be spelled out at their first usage. 8. Documents used with the text shall have their number and title stated at their first usage; thereafter, only their number shall reference them; the reference in Section 2.0, applicable documents, shall not be counted as the first usage. 9. Values that have not been established exactly at the time of writing shall be identified as a representative value. These numbers shall be identified with an asterisk and denoted at the bottom of the page as follows: "*denotes a representative value." 10. Information unavailable at the time of writing shall have a space reserved for it, and shall be identified with "TBD" (to be determined). 	

Contract No. ***	
Date: 3/4/05 , Page 2 of 4	
DATA REQUIREMENT DESCRIPTION	
TITLE: Functional Requirements Document (FRD)	NUMBER: SE-001
USE: This presents detailed guidelines for the preparation of both preliminary and final Instrument (Level-4) Functional Requirements Documents (FRDs).	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>Specific Formal Guidelines for Instrument Requirements</p> <p>All Level-4 FRs are to have the following eight sections. If one (or more) of these sections is not applicable to a particular FR, the section number and titles shall be included with the statement "Not Applicable". Science subsystems may also have Section 9.0, Special Requirements.</p> <ol style="list-style-type: none"> Section 1.0, Scope, is a concise statement identifying the subsystem covered by the FR and its intended use. The standard statement shall be: <p>This document establishes the FRs of the (name of instrument) (abbreviation of instrument name), which is used to...</p> Section 2.0, Applicable Documents, will be written as shown below. List all documents, and only those documents, referenced in the text. Any additional documents unique to the instrument should also be listed <p>The documents listed below govern project policies, mission requirements, design constraints, and operations philosophy. As such, they are intended to define top-level design, interface, operations, and test requirements to which all Project hardware and software must conform. Where options are allowed in the implementation of any requirements herein, designers should conform as near as possible to the patterns of subsystem and interface design required by the documents listed. The latest issues of these documents, upon the release date of the FRD, shall apply.</p> <ol style="list-style-type: none"> Design Requirements Interface Requirements S/C Contractor Design Requirements S/C Contractor Interface Requirements S/C Contractor Test Requirements NASA Design Requirements Section 3.0, Functional Requirements, shall contain a functional block diagram and a listing of each of the FRs that the subsystems must satisfy. This section tells what the subsystem must do. For the science subsystems, this section may also include a concise list or statement of the science experiment's objectives. Section 4.0, Functional Description, shall tell how the subsystem accomplishes the functional requirements of Section 3.0. It shall include <ol style="list-style-type: none"> A Description of the major functional elements A state diagram indicating the subsystem's response to external stimuli, commands, etc. Operational sequences, flow diagrams, layout diagrams, and other tabular information may be included as required. 	

Contract No. ***	
Date: 3/4/05 , Page 3 of 4	
DATA REQUIREMENT DESCRIPTION	
TITLE: Functional Requirements Document (FRD)	NUMBER: SE-001
USE: This presents detailed guidelines for the preparation of both preliminary and final Instrument (Level-4) Functional Requirements Documents (FRDs).	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>5. Section 5.0, Interface Definition, shall contain a summary compilation of all system-level interfaces, but not duplicate information in the applicable Interface Control Documents (ICDs).</p> <p>(a) Electrical Interfaces. The following standard introduction shall be used:</p> <p>3.1.1 General</p> <p>a) Basic requirements for electrical grounding, electrical interface circuits, and electrical isolation are contained in the spacecraft contractor General Interface specification document.</p> <p>b) Specific system-level requirements of electrical interface circuits, grounding methods, signal levels, and timing relationships are contained in the applicable circuit data sheets within the spacecraft ICDs.</p> <p>There is to be a set of paragraph summarizing the interfaces with each subsystem. These paragraphs shall contain a one- or two-sentence description of each interface.</p> <p>(b) Mechanical Interfaces. This paragraph should specify requirements on the subsystem's mechanical interfaces. Reference should be made to the subsystem's interface control drawing with the spacecraft.</p> <p>(c) Thermal. This paragraph should include any special thermal interface required, such as thermal isolation.</p> <p>(d) Optical, radio frequency, and natural radiation interface requirements may be included, if appropriate.</p> <p>(e) Interfaces with system other than the spacecraft shall be called out and referenced to the applicable interface requirements document.</p> <p>6. Section 6.0, Performance Parameters, states the measurable performance parameters necessary to meet the Section 3.0 FRs and the Section 4.0 functional description. Items to be specified are frequency and energy ranges, optical field-of-view, power, sensitivity, frequency response, dynamic range, resolution, signal-to-noise ratios, bit rates, cycle times, timing accuracy, etc.</p>	

Contract No. ***	
Date: 3/4/05 , Page 4 of 4	
DATA REQUIREMENT DESCRIPTION	
TITLE: Functional Requirements Document (FRD)	NUMBER: SE-001
USE: This presents detailed guidelines for the preparation of both preliminary and final instrument (Level-4) Instrument Functional Requirements Document (FRD).	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>7. Section 7.0, Physical Characteristics and Constraints, shall define representative values of the physical characteristics of the subsystem as follows, but should reference PDxxxx for initial resource allocations:</p> <ul style="list-style-type: none"> (a) Mass. Reference shall be made to PDxxx for the mass. (b) Power. Reference shall be made to PDxxx for the subsystem power (c) Volume. The volume shall be given and reference shall be made to PDxxx and PDxxx. (d) Environmental. Reference shall be made to the subsystem being compatible with the requirements of the Environmental Design requirements documents in Section 2.0. (e) Packaging. There are no formal project packaging requirements; methods to be used should be described. (f) Location and Mounting. In cases where special mounting or location constraints exist, reference shall be made to the spacecraft-unique ICD. (g) Identification and marking. Reference should be made to PDxxx. (h) Environmental. Use the following statement: <p style="padding-left: 40px;">The xxx subsystem shall be designed to operate within specification of the type-approval temperature range that is xx degrees C. In addition, the subsystem shall be compatible with the requirements of the project Environmental Design Requirements.</p> <p>8. Section 8.0, Safety Considerations, shall list the factors that must be considered in formulation operation procedures to ensue the safety of personnel, equipment, and facilities.</p> <p>9. Section 9.0, Special Requirements, may be used only in the science instrument FR, where its use is optional. This section shall list science instrument requirements or details not covered previously. It shall include those items necessary to more completely characterize a science instrument and its performance on the spacecraft, as well as constraints levies on the science instrument by the spacecraft system. But, these requirements are limited to the subsystem or system functional tests.</p>	

Contract No. ***	
Date: 3/4/05 , Page 1 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Verification and Test Plan	NUMBER: SE-002
USE: Describes the Contractor's approach for Assembly Verification and Test	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION:</p> <p>Prepare and submit an Instrument Verification and Test Plan that defines the approach and methods the Contractor will implement to verify the Instrument meets the requirements in the FRD and ICD. The plan must describe how Instrument functional, performance, and reliability requirements will be verified at all levels (Instrument, subsystem, assembly, etc.) as well as a function of design and implementation maturity (breadboards, engineering models, flight hardware, Instrument/system integration & test, and post launch). The plan should address how Instrument interfaces will be verified, including those which the spacecraft, launch vehicle (if applicable), mission operations system, and Deep Space Network.</p> <p>Where verification and test information required herein are provided in separate and prior delivered items, the applicable sections may be referenced and supplemented herein as appropriate.</p> <p>The plan requires the following as a minimum:</p> <ol style="list-style-type: none"> (1) Verification matrix of Contractor-generated requirements with traceability from Exhibit III to all contract specifications (partitioned from system-level to subsystems, assemblies, payload interfaces, etc) identifying verification methods for each requirement. (2) Detailed flow chart(s) of all planned test verification activities from assembly to Instrument-level, and including test interrelationships, functional verification, dynamic and environmental test, inspections, analyses, and other activities planned by the Contractor and subcontractors to verify compliance with all requirements. (3) Detailed environmental test matrix of assembly and instrument level environmental tests (including the planned test levels, using P for Protoflight test level/duration and F for Flight Acceptance test level/duration). An example of such a test matrix is attached. (4) For requirements that will not be verified by test or calibration on the flight Instrument (e.g., fault protection, margin testing), describe the methods by which these requirements will be validated. Where testbeds, analyses, engineering model hardware will be utilized, provide a description of what will be done to validate that such approaches provide a suitable representation of the flight system as the work evolves over the pre-launch life of the contract. (5) The plan requires descriptions of the following: <ol style="list-style-type: none"> a. Description of all hardware and configurations during verification activities b. Test levels and durations (as applicable) c. Pass/Fail criteria for all verification activities d. Method of testing, facilities (including location), instrumentation, and controls used. e. Test data and analysis methodology. f. Plans and approach for development measurement uncertainties for verification test (as applicable). g. Contractor's plans for Test Readiness Reviews and/or post-test result reviews h. Safety issues and concerns i. Summary schedule of verification activities. 	

Contract No. ***	
Date: 3/4/05 , Page 2 of 2	
DATA REQUIREMENT DESCRIPTION	
TITLE: Verification and Test Plan	NUMBER: SE-002
USE: Describes the Contractor's approach for Assembly Verification and Test	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
<p>PREPARATION INFORMATION (cont.):</p> <ul style="list-style-type: none"> (6) Preliminary schedule for all planned tests. (7) Listing of Test Procedures for all functional and environmental tests. (8) The plan must specify the applicability of all verification activities to engineering model, structure/thermal model, protoflight hardware, spares, testbeds, and all support equipment and ground handling fixture deliverables. (9) Where analyses verify requirements, the plan must specify the analysis methodology, verification procedures, and uncertainties. Also, the plan must specify the source and method of collection and verification of data supplied to the analyses. (10) Identify all parameters requiring calibration. Include required calibration uncertainties and methodology and plan for establishing and verifying calibration errors. (11) Where appropriate, the plan specifies the relationships, interdependencies and planned calibration activities. <p>The Instrument Verification and Test Plan shall be consistent with the MSL Mission Assurance Plan (JPL D-27175) and MSL Environmental Requirements Document (JPL D-21382)</p>	

Instrument	Acoustics	Random Vibration	Sine Burst	Pyrotechnic Shock	Thermal Vacuum	Thermal Atmosphere	Launch Pressure / Venting	Radiated Susceptibility	Conducted Susceptibility	Radiated Emissions	Conducted Emissions	Isolation	Magnetics	Solid Particles	High Energy Radiation	Atomic Oxygen	A=Analysis P=Protoflight Level Test F=Flight Acceptance Level Test T=Test Required H=Test or Analysis Required at a Higher Level of Assembly - = No test or analysis required
COMMENTS																	
	Dynamics			Thermal			EMC/Magnetics						Space Env				
EM INSTRUMENT ASSEMBLIES																	
Instrument Electronics																	
Assy #1	-	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-	
Assy #2	-	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-	
Assy #3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Instrument Optics																	
Assy #1	-	P	-	-	P	-	-	-	-	-	-	-	-	-	-	-	
Assy #2	-	P	-	-	P	-	-	-	-	-	-	-	T	-	-	-	
Instrument Structure																	
	-	P	-	-	P	-	-	-	-	-	-	-	T	-	-	-	
FLIGHT INSTRUMENT SYSTEM																	
	-	P	H ₁	H ₁	T ₁	-	-	T	T	T	T	T	T	A	A	A	H ₁ = test performed at spacecraft level T ₁ = instrument level thermal balance and margin test
Instrument Electronics																	
Assy #1	-	P	-	-	H ₂	P	A	H ₂	H ₂	H ₂	H ₂	H ₂	-	-	-	-	H ₂ = test done at instrument level
Assy #2	-	P	-	-	H ₂	P	A	H ₂	H ₂	H ₂	H ₂	H ₂	-	-	-	-	H ₂ = test done at instrument level
Assy #3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Instrument Optics																	
Assy #1	-	P	-	-	H ₂	P	A	H ₂	H ₂	H ₂	H ₂	H ₂	-	-	-	-	H ₂ = test done at instrument level
Assy #2	-	P	-	-	H ₂	P	A	H ₂	H ₂	H ₂	H ₂	H ₂	-	-	-	-	H ₂ = test done at instrument level
Instrument Structure																	
	-	P	-	-	H ₂	P	A	H ₂	H ₂	H ₂	H ₂	H ₂	-	-	-	-	H ₂ = test done at instrument level
Thermal Control Assemblies																	
Heatpipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Radiators	H ₂	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H ₂ = test done at instrument level

Contract No. ***	
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DATA REQUIREMENT DESCRIPTION	
TITLE: Verification and Test Plan	NUMBER: SE-002
USE: Describes the Contractor's approach for Assembly Verification and Test	PROJECT: MSL
INTERRELATIONSHIP:	REFERENCES:
PREPARATION INFORMATION (cont.): <div style="text-align: center; margin-top: 20px;"> Example Environmental Test Matrix </div>	